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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/816,989 | 04/01/2004 | Ju-Cheol Shin | 2522-055 | 2017 |

20575 7590 01/30/2006

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| EXAMINER | |
|---|---|
| LEE, CALVIN | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2818 | |

DATE MAILED: 01/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/816,989 | SHIN et al. | |
| | Examiner | Art Unit | |
| | Lee, Calvin | 2818 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 8-13* is/are rejected.

7)☒ Claim(s) *7* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## OFFICE ACTION

### *Response to Amendment*

1. The Foreign Priority Paper (i.e., the Translation) received on 11/8/05 is acknowledged.

### *Claim Rejections - 35 U.S.C. § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Akasaka et al*

a) In re claims 1 and 5, *Akasaka et al* (US 6,893,980) discloses a method of manufacturing a semiconductor device, comprising the steps of:

-forming a tungsten layer pattern having an oxidized surface on a substrate [col. 7];

-introducing a source gas including silicon (e.g., $SiH_2Cl_2$ , $SiH_4$ found in col. 7) into the oxidized surface of the tungsten layer pattern to form a protecting layer 20 [col. 8];

-thermally treating the substrate [step 5 in col. 9]

*Akasaka et al* teaches forming the protecting layer to prevent the damage of the surface of the tungsten oxide film, but not "to prevent an abnormal growth of oxide contained in the oxidized surface of the tungsten layer pattern." The functional recitation "to prevent an abnormal growth of oxide..." has not been given patentable weight because it is narrative in form unless it must be expressed as a "means" for performing the specified function, as set forth in 35 USC 112, 6$^{th}$ paragraph, and must be supported by recitation in the claim of sufficient structure to warrant the presence of the functional language. *In re Fuller*, 1929 CD 172, 388 O.G. 279.

b) In re claims 2-3, *Akasaka et al* also discloses forming on the oxidized surface of the tungsten layer a tungsten oxide layer formed by pressure CVD or plasma CVD [col. 7, ln.7].

c) In re claim 4, *Akasaka et al* suggests forming protecting layer, comprising the steps of:
-maintaining a temperature of the substrate in a range of 550° to 780°C [Fig. 2];
-introducing a silane gas onto the oxidized surface of the tungsten layer to react with the oxidized surface [col. 7, ln.33].

*Akasaka et al* does not suggest the flow rate of the silane gas. Note that the specification contains no disclosure of either the critical nature of the claimed flow rate of any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990).

d) In re claim 6, *Akasaka et al* suggests the protecting layer having a thickness of 100nm [col. 7, ln.2], but not about 1Å to about 100Å.

It would have been an obvious matter of design choice to have the claimed layer thickness (closely suggested by *Akasaka et al*), since such a modification would have involved a mere change in the size of an isolation structure. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955).

4. Claims 8-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over *APA* (Applicant's Prior Art) in view of *Akasaka et al* (US 6,893,980).

a) In re claims 8 and 11, *APA* discloses a method of manufacturing a semiconductor device:
-forming a photoresist pattern on a tungsten layer formed on a substrate [pg. 1, ln.30];
-selectively etching the tungsten layer using the photoresist pattern as an etching mask to form a tungsten layer pattern on the substrate [pg. 1, ln.33]; and removing the photoresist pattern;
-forming a tungsten oxide layer on the tungsten layer pattern by thermal treatment [pg. 2, ln.1];
-thermally treating the substrate [pg. 2, ln.3].

b) In re claim 9, *APA* suggests removing the photoresist by an ashing process or a stripping process [pg. 1, ln.34].

c) In re claim 13, *APA* inherently teaches an insulating layer formed on the substrate including the tungsten pattern [pg. 2, ln.15].

d) *APA* however fails to disclose the step of introducing a source gas including silicon onto the tungsten layer pattern to form a protecting layer that prevents an abnormal growth of oxide. *Akasaka et al* discloses, "introducing a source gas including silicon (e.g., $SiH_2Cl_2$ , $SiH_4$ found in col. 7) into the oxidized surface of the tungsten layer pattern to form a protecting layer **20** [col. 8]

Therefore, *APA* in view of *Akasaka et al* teaches or suggests introducing a source gas including silicon onto the oxidized surface of the tungsten layer pattern to form a protecting layer.

It would have been obvious to one having skills in the art to have modified the process of Applicant's Prior Art by utilizing a silane-gas treatment for the purpose of prevent the damage of the surface of the tungsten oxide film, as taught by *Akasaka et al* [col. 5, ln.33].

e) In re claim 10, *Akasaka et al* suggests forming protecting layer, comprising the steps of:
-maintaining a temperature of the substrate in a range of 550° to 780°C [Fig. 2];
-introducing a silane gas onto the oxidized surface of the tungsten layer to react with the oxidized surface [col. 7, ln.33].

Neither *Akasaka et al* nor *APA* teaches or suggests the flow rate of the silane gas. Note that the specification contains no disclosure of either the critical nature of the claimed flow rate of any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 16 USPQ 2d 1934, 1936.

Furthermore, it would have been obvious to one having skills in the art to have modified the protecting film formation of *APA* and *Akasaka et al* by utilizing the claimed silane flow rate because one would adjust formation temperature and/or gas flow rate to result in the most effective protecting layer formation.

f) In re claim 12, *APA* is silent about the layer's thickness. *Akasaka et al* suggests the protecting layer having a thickness of 100nm [col. 7, ln.2], but not about 1Å to about 100Å.

It would have been an obvious matter of design choice to have the claimed layer thickness (closely suggested by *Akasaka et al*), since such a modification would have involved a mere change in the size of an isolation structure. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955).

***Allowable Subject Matter***

5. Claim 7 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim because *Hashimoto et al* (US 6,022,586) discloses introducing silane gas for allowing silicon to be deposited on the surface of the tungsten silicide [col. 10, ln.38], but not implanting silicon ions to the oxidized surface of the tungsten layer.

***Contact Information***

6. Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 on Mondays thru Thursdays 6:30-4:30PM. If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2818's Supervisory Patent Examiner *David Nelms* can be reached at (571) 272-1787. The fax phone number for the organization (where this application is assigned to) is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAG or Public PAIR. Standard information for unpublished applications is available through Private PAIR only. For more information about the PAX system, see http://pair-direct.uspto.gov Should you have questions on access to the Private PAR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Calvin Lee